Key strategies improving the outcome of patients with peripheral venous catheters: report of an international panel discussion

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Conflict of interest

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Abstract

This article reports the opinions of an infection prevention panel of experts following a meeting convened during the 2012 World Congress of Vascular Access Congress (WoCoVa). The meeting reviewed some topics related to the use of peripheral venous catheters (PVCs) with a specific focus on infection prevention. The international panel agreed that lack of clinical evidence and scientific research regarding PVC management is a major cause of significant variances in practice. The panel has outlined a number of strategies that promote infection prevention during PVC use. However, no overall agreement was reached on all issues. Other reasons for non-resolution were mostly due to variance among countries due to differences in the organization of healthcare systems, differences in availability of materials and difference in national or supranational regulations.

Key words Peripheral Catheterization, Catheter-Related Infections, Quality of Health Care

Background

Peripheral Venous Catheters (PVC) are one of the most common devices used in the delivery of medications and fluids to patients. Approximately 330 million short peripheral catheters are sold annually in the United States alone.[1] In the EU, 46.7% (country range 30.6%–70.6%) of patients in acute care hospitals have one or more PVCs.[2] Over previous decades, the use of PVCs has grown

significantly in outpatient and alternative care settings. Intravenous catheters are the primary identifiable source of bloodstream infections (bacteremia and fungaemia).[3] However, the magnitude of the proportion of infections associated with short peripheral versus central venous catheters remains unclear. Microbiologically confirmed PVC-related bloodstream infection accounts for 0.4% of all healthcare-associated infections in the EU.[2] Data on incidence of bloodstream infections (BSIs) associated with peripheral venous catheters are limited. Alternatively, it is uncommon to draw blood cultures through the PVC to confirm a potential PVC-related BSI. Moreover, contamination of the blood cultures with micro-organisms that colonize the PVC catheter or hub, is possible. McLaws and colleagues found a BSI rate for all peripheral lines of 0.2 (95%CI: 0.0 - 0.5) per 1000 line-days in ICU.[4] Although those BSI numbers seem low, they result in a significant number of affected patients. It was estimated in one study, which investigated Staphylococcus Aureus bacteremia's, that there may be as many as 10,028 PVC-related bacteremia's yearly in US adult hospitalized inpatients.[5]

Despite the generalized use of PVCs, a range of procedures and a variety of products are available to support peripheral venous access management. As awareness around practice increases, the need for improving PVC care becomes clearer.[6] Hadaway found in a recent integrative literature review on short PVC and infections that although much research is carried out on this topic, variables

and research design issues leave numerous unaddressed issues and unanswered questions.[1]

A panel with extensive professional experience was convened to address two main goals: (1) to identify important issues in infection prevention and, (2) to agree on key strategies .

Methods

A roundtable meeting of 10 healthcare professionals from 8 different countries (Belgium, Denmark, Germany, Italy, Qatar, Sweden, United Kingdom, USA), was sponsored by BD Medical as part of 2nd World Congress on Vascular Access (WOCOVA) conference, June 2012 in Amsterdam. This was an independent meeting and BD Medical was not involved in either the content or outcome of the discussions. Three key areas associated with PVC management were proposed for discussion: insertion, care and maintenance. “Insertion” refers to the procedure of the (re)placement and characteristics of the peripheral cannula and the material for insertion. “Care” is defined as all actions taken to keep the catheter in place and to protect the insertion site. “Maintenance” is defined as all measures taken to keep the catheter patent.

Panelists then proposed their key strategies for improved patient outcomes around these three areas. The mentioned strategies therefore do not claim to reflect all infection prevention measures.

Results

1. PVC insertion

What are the contributing factors in the choice for a certain type of catheter?

The choice of PVC is often based on preferences. Many of the panel concurred regarding the relationship between different clinician groups and design preferences. These preferences, however, are not always based on scientific evidence. For instance, PVCs that include an access port on top of the catheter hub/adapter, also called ported catheters, are frequently used by anesthesiologists for the administration of anesthetic drugs during procedures. These ported catheters could, by design, contribute to a higher infection risk due to the lack of a closed intravenous system.

Another important factor is the use of safety technology to prevent needle stick injuries incorporated into the design of the PVC. The move to PVCs with safety technology has been a challenge in some areas of the world. Panelists concurred that design choice often comes down to cost, regardless of scientific evidence. Change will therefore be slow unless it reduces costs or is required by law. The panel acknowledged that the United States Needlestick Safety Legislation of 2000 has driven an almost 100% adoption of safety IV catheters in acute care hospitals but not in alternative settings such as physician offices and clinics. The European sharps directive, May 2013, requires a risk assessment to determine the use of safety devices, although methods of implementation and enforcement are not yet clear.

Agreement was not reached regarding the best practice for the choice of the cannula gauge size. The drivers that currently impact choice are: (1) clinical preference, (2) perception of gauge size requirements, (3) flow requirements, and (4) availability of electronic infusion equipment.

What are the features of skin antisepsis and glove use?

The panel concurred on the use of ChlorHexidine Gluconate (CHG) in 70% isopropanol for skin antiseptic agents prior to PVC insertion. Although it was mentioned that octenidine-hydrochloride/isopropanol was also used as an alternative antiseptic solution. The technique of application, most agreed that the best practice was to scrub back and forth and left to right, followed by the recommended drying time. Discordance among panel members was observed on the issue of the use of sterile gloves versus clean single use gloves during the insertion procedure. While all agreed that best practice is to always maintain a sterile procedure if possible, re-palpating the site after preparation is often observed. The panel concurred to always make every effort not to contaminate the site prior to PVC insertion.

When should the PVC be replaced?

The panel agreed that a distinction needed to be made between PVCs initially inserted using best practice, or not, such as in emergency situations. The participants all agree that any PVC inserted without adherence to the best

infection prevention techniques should be resited as soon as possible. Many guidelines and standards recommend within 48 hours. No formal mechanism has been identified for a planned PVC replacement in routine care. Therefore, any transfer of the patient from one patient care area to another should include a discussion on the status of the PVC.

What is the preferred content of a PVC insertion pack?

Panel members agreed that the use of ready-made packs or kits that included cannulation equipment for the PVC insertion procedure were convenient. Components of such packs varied considerably within the experience of the panel. The advantages of using such a packs are that they conveniently place all insertion materials in one place. These packs also contribute to the patient's comfort as facilitating an efficient insertion procedure. Moreover they can also encourage compliance with best practice. The panel agreed that the cost of these packs must be justified.

2. PVC Care

What are best practices for PVC dressing and stabilization to prevent infection?

There was some disagreement between panelists on dressing technique. However, the group agreed that whatever materials are used, site visualization is critical to best practice management. Moreover, the group recommended

strongly that loose dressings should be changed. The practice of planned site cleaning and dressing change remained unclear.

The group reported a high level of variance around the methods used to stabilize a catheter such as (1) gauze and tape, (2) transparent membrane dressings, and (3) devices specifically designed to stabilize the PVC. Agreement was reached relating to the importance of stabilization of the catheter to prevent movement in the insertion site and subsequent infiltration/extravasation and phlebitis.

What are key strategies in infection prevention with the use of needleless connectors?

All panelists agreed that when needleless connectors are used, cleaning is paramount. However no strong agreement on the cleaning technique was reached. Two issues raised in this regard were: (1) the various connector designs and (2) the effectiveness of cleaning procedures. All agreed that the use of friction in the cleaning process and allowing adequate drying time were essential to a successful outcome. No agreement was formulated on adequate cleansing time. On the contrary the panelists agreed that 2% ChlorHexidine Gluconate in alcohol is preferred. Many countries do not have access to the 2% concentration of this solution and therefore it remains a deterrent to full scale adoption. Most of these agents have been brought to market for skin antisepsis, and little evidence exists supporting the efficacy of these agents on inanimate objects such as connectors. The panelists supported the new to market

"disinfecting cap" which is designed to be placed on top of the needleless connector. In theory, this device protects the connector from contamination while not in use. Panelist agreed that cost of implementation could be an issue in most countries.

3. PVC maintenance

What are the best flushing and locking practices to ensure patency in PVCs?

The group advocated normal saline as preferred locking solution for PVCs used for intermittent access.. However, one panelist reported the use of an obturator as an alternative to a locking solution. An obturator is a sterile stylet that blocks up the entire inner side of the catheter lumen to prevent thrombus formation when the infusion is discontinued. The panelists agreed that obturators should not be recommended because of the increased risk of contamination via de PVC hub and blood exposure.

All panelists supported the need to flush the PVC before and after medication administration. With reported flushing volumes in the range of 5-10mL. The use of pre-filled flush syringes was recommended, but financial impact of (hospital-wide) use could impact adoption. However, panelists agreed that pre-filled saline syringes should not be used for medication preparation with the rationale that there is an increased risk of contamination and potential medication errors due to inaccurate labeling.

Key strategies on PVC insertion, care and maintenance are outlined in box 1.

Conclusion

The conclusion of this panel was that medical devices or equipment associated with vascular access can support infection prevention. However these products are not always available in all countries and cost is always an important factor when deciding to implement new materials. Products can support improvement if combined with education, both should go hand in hand. Regulatory authorities may also enhance change processes towards improved patient outcomes. Further studies, covering the PVC areas discussed above, should be encouraged to fill the current research gaps.

In summary, the risk of Blood Stream Infections associated with the insertion and/or maintenance of PVC is limited at best. Therefore the expert panel encourages adoption of these interventions to minimize BSI risk in patients with a PVC.

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Box 1 Key strategies agreed along the panel

1. PVC Insertion

Use ChlorHexidine in Alcohol preparation for skin antisepsis.

Use a back and forth friction with the disinfectant and allow the preparation to dry completely prior to insertion of the device.

Use sterile gloves if palpation of the site is necessary after prepping.

Replace the PVC as soon as possible if infection prevention strategies were not employed during the insertion

2. PVC care

Maintain the PVC dressing dry and intact.

Minimize catheter movement.

Ensure that the insertion site is visible to allow for inspection.

Needleless connectors cleaning with a 2% chorhexidine in alcohol is preferred.

Clean needleless connectors using a scrubbing technique and allow to dry thoroughly prior to access.

3. PVC maintenance

Use a normal saline lock when continuous infusion is no longer required.

Perform a normal saline flush prior and after each medication administration.

Use pre-filled flush syringes.

Do not use pre-filled flush syringes for reconstitution or dilution of medications.